The F336 bacteriophage recognizes the capsular phosphoramidate modification of Campylobacter jejuni NCTC11168

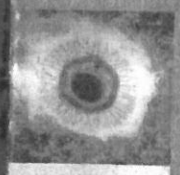
Sørensen, Martine Camilla Holst; van Alphen, Lieke; Harboe, Anne Gunnersen; Li, Jianjun; Christensen, Bjarke Bak; Szymanski, Christine M.; Brøndsted, Lone

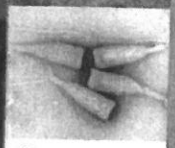
Publication date:
2010

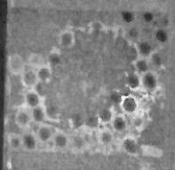
Document version
Publisher's PDF, also known as Version of record

VIRUSES OF MICROBES

VIRUS DE MICROBES







JUNE 21-25, 2010
Institut Pasteur, Paris, France

ABSTRACT BOOK
LIVRE DES RÉSUMÉS

ileDeFrance

Institut Pasteur

VIRUSMICROBES2010/135
The F336 bacteriophage recognizes the capsular phosphoramidate modification of Campylobacter jejuni NCTC11168

Martine C. H. Sørensen[a], Lieke Van Alphen[b], Anne Harboe[a], Jianjun Li[c], Bjarke B. Christensen[d], Christine M. Szymanski[b] and Lone Brøndsted[a]
[a]University of Copenhagen, Dept. Veterinary Disease Biology, Stigbøjlen 4, 1870 Frederiksberg C, Denmark
[b]University of Alberta, Biological Sciences, Edmonton, AB, Canada T6G 2E9
[c]Nat Research Council of Canada, Inst of Biological Sciences, Ottawa, AB, Canada K1A 0R6
[d]Technical University of Denmark, National Food Institute, Mørkhøj Bygade 19, 2860 Søborg, Denmark
lobr@life.ku.dk

Campylobacter jejuni is the most common cause of bacterial gastroenteritis in the developed world. Symptoms range from mild to severe diarrhea and may, in rare cases, lead to life-threatening disorders of the autoimmune system. Poultry meat is regarded as the major source of infection since C. jejuni commonly colonises the poultry intestine and contaminated faecal matter is readily transferred to the meat during slaughter. Previously, we isolated a number of bacteriophages infecting C. jejuni that could potentially be exploited to reduce the number of C. jejuni in poultry prior to slaughter. To investigate the mechanisms behind phage resistance against C. jejuni, we used phage F336 belonging to the Myoviridae family to select a C. jejuni NCTC11168 phage resistant strain. We found that phage F336 has reduced adsorption to the phage resistant strain, thus indicating that the receptor is altered. While proteinase K treated C. jejuni cells did not affect adsorption, periodate treament resulted in reduced adsorption, suggesting that the phage binds to a carbohydrate moiety. While the lipoologosaccharides of the wild type and phage resistant strains were similar, we found a significant difference in the capsular polysaccharides using high resolution magic angle spinning NMR spectroscopy. Interestingly, the phage resistant strain lacks an O-methyl phosphoramidate (MeOPN) moiety attached to the GalfNAc on the capsular polysaccharide (CPS), which was further confirmed by mass spectroscopy. Sequence analysis of the phage resistant strain showed that the phase variable gene cj1421, which encodes the GalfNAc MeOPN transferase contains a tract of 10 G's resulting in a non-functional gene product. However, when the phage resistant strain reverted back to phage sensitive, cj1421 contained 9 G's and the GalfNAc MeOPN was regained in this strain. Of particular note is that we observed reduced plaquing efficiency by six of our phages on the resistant NCTC11168 strain, suggesting that the MeOPN moiety of the CPS is the receptor for several phages infecting C. jejuni. In summary, we have identified a novel receptor of phages infecting C. jejuni and propose that phage predation is the driving force behind the large diversity of capsular polysaccharides and their modifications in C. jejuni.

Number of words in abstract: 350
Keywords: C. jejuni - receptor - capsule
Technical area: Session D: Virus-Cell Interactions
Special session: Not specified
Presentation: Oral preferred, but poster accepted
Special equipement: No special equipment